EXTERNAL INDEPENDENT REVIEW OF THE RUN IIb CDF DETECTOR AND D-ZERO DETECTOR UPGRADE PROJECTS AT FERMI NATIONAL ACCELERATOR LABORATORY CHICAGO, ILLINOIS

The High Energy Physics program of the DOE Office of Sciences conducts basic research at Fermi National Accelerator Laboratory (FNAL) using the Tevatron Collider. The FNAL Tevatron provides the highest energy particle beams in the world, colliding protons and antiprotons with enormous energy, enabling unique opportunities for scientific discovery. The two detectors, CDF and D-Zero, which observe these collisions, are being used to address the electro-weak interaction—the highest priority research of the US High Energy Physics (HEP) program. The purpose of these projects is to upgrade the CDF and D-Zero detectors, which, in turn, will allow the Tevatron to continue to perform this significant High Energy Physics research until the Large Hadron Collider (LHC) at CERN begins operation in late FY2007. Both projects will replace portions of silicon detectors and associated electronics, and the CDF project also will be upgrading one of the CDF detector systems.

In October - November 2002, a team of individuals from JUPITER Corporation and it's subcontractor, Hill International, conducted an External Independent Review (EIR) / Independent Cost Review (ICR) of the Run IIb CDF Detector and D-Zero Detector Upgrade Projects at Fermi National Accelerator Laboratory for readiness for Critical Decision (CD) 2, *Approve Performance Baseline*. The Team consisted of members skilled in relevant areas including cost estimating, scheduling, engineering, and management. Based upon that review, the EIR/ICR Team has concluded that both projects are quality projects, each with a scope appropriately defined by the scientific experiment that the successful execution of these projects will enable. The projects are being well managed. Each has effectively employed peer review—characteristic of scientific research within academia—to provide the rigor to the project management process necessary to project success. Merging the best elements of modern project management as reflected in DOE O 413.3 and DOE project management guidance with the peer review process, without compromising either, is a noteworthy accomplishment of these two projects. The design documents developed to this point seem appropriate and are very comprehensive. The use of physical models and mockups by the projects in the development of design is also noteworthy. Further, the EIR/ICR Team noted other positive practices being followed, including the broad and systematic application of Value Engineering. The cost estimate, as checked by the ICR, is reasonable and realistic. The ICR report is provided as an appendix to the EIR report.

The EIR/ICR Team made two essential findings, one finding, and a number of observations in the course of the review. Of the two essential findings, one is a straightforward matter of a need to make appropriate references in the Project Execution Plan to the Project Management Plans for each project, so that the Project Execution Plan will be complete in accordance with DOE O 413.3. The other is of a more programmatic nature. The two essential findings and one finding are briefly noted below. In the view of the EIR/ICR Team, upon satisfactory resolution of the two essential findings, both projects will be ready to receive CD-2.

Management, Planning, and Control – Essential Findings

- The Project Execution Plan for these projects is incomplete. While included in the Project Management Plans, many technical considerations required to be in the PEP by DOE O 413.3 are neither addressed nor referenced in the PEP.
- Neither project has developed a project specific configuration management and control process, as required by DOE O 413.3. Further, no Laboratory configuration management/control policy or procedure is cited in the PMP of either project. Moreover, no signature or other indication of approval exists on the Technical Design Report (TDR) for either project.

Management, Planning, and Control –Finding

- There is no description or reference in the PEP, or in either project PMP, to flow-down of requirements and processes for Quality Assurance/Quality Control to specifics of design, fabrication, procurement, or establishment/maintenance of document approval/authenticity.